

Remarks

The Applicants acknowledge the 35 U.S.C. §112 rejection of Claims 1, 3, 5, 6 and 10 – 15.

The Applicants also note with appreciation the Examiner’s helpful comments regarding specific aspects of the various claims.

It appears as if some of the confusion with respect to various aspects of the claims arises from past amendments that have not been entirely clear. The Applicants have accordingly amended Claim 1 to simplify its reading and understanding, as well as the flow of the various steps recited therein. Thus, Claim 1 now recites a method for converting a crude starting material, wherein the starting material comprises 5 to 80% by weight of benzene, other aromatic hydrocarbons and non-aromatic compounds in an amount of at least 1% by weight. The crude starting material is converted to useful C7 and C8 aromatic hydrocarbons. The affirmatively recited steps include lowering the content of the non-aromatic compounds by distillation to produce a material having a non-aromatic compound content of 1% by weight or less, and reacting the material formed in the first step in the presence of hydrogen and a catalyst containing mordenite and between about 0.02 to 2% by weight rhenium to diminish the benzene content of the material and convert at least a portion of the material into C7 or C8 aromatic hydrocarbons. The Applicants respectfully submit that this simplification of independent Claim 1 should cure the issues helpfully raised by the Examiner.

Specific changes include removal of the term “refined starting” material. Although the Applicants believe that this term is completely supported in the Specification, such as recited in the paragraph spanning pages 9 and 10 wherein the term “refined” is repeatedly used in the context in which it was intended, the Applicants have nonetheless removed this term so that it will not be confused with the “crude starting” material referred to in the preamble. Specifically, there should

be less confusion by eliminating a reference to two starting materials when logic indicates that one starting material would be more appropriate.

The Applicants have chosen to retain the language concerning “to convert at least a portion.” In fact, that is what the process does. Reference to Table 1 in the Specification that spans pages 16 and 17 readily indicates that portions of the material are converted into C7 or C8 compounds. It would, in fact, be inaccurate to state that all of the material is converted into C7 or C8 aromatic hydrocarbons. Therefore, the Applicants respectfully submit that such language is not only fully supported, but factually accurate. Withdrawal of the rejection as it applies to that language is respectfully requested.

Claims 5, 6, 11, 13, 14 and 15 have also been amended in view of the removal of the “refined starting” language referred to above. The Applicants respectfully submit that those claims are also in conformance with §112.

With respect to Claims 14 and 15, the Applicants respectfully submit that they are not inconsistent with Claim 1. They merely provide for preferred embodiments wherein the amount of material having a non-aromatic compound content of 1% by weight or less is actually 0.5 % or less or 0.1% or less, respectively. Withdrawal of the §112 rejection as it applies to Claims 14 and 15 is also respectfully requested.

Turning now to the merits, the Applicants acknowledge the rejection of Claims 1, 3, 5, 6 and 11 – 15 under 35 U.S.C. §103 over King, alternatively in consideration with the so-called “admitted” art in the Applicants’ Specification. In that regard, the Applicants note with appreciation the Examiner’s helpful comments concerning the applicability of King to the solicited claims. However, the Applicants respectfully submit that King is quite different from the invention as recited in the solicited claims and would not render the solicited claims obvious. In fact, the Applicants

claim process results in a very surprising phenomenon not to be expected by one of ordinary skill in the art.

In particular, the Applicants have discovered that crude starting material that includes 5 to 80% by weight of benzene, other aromatic compounds and non-aromatic compounds in an amount of at least 1% by weight present problems in efficient conversion to useful C7 and C8 aromatic hydrocarbons. This is demonstrated in Comparative Example 1 in the Applicants' Specification. Specifically, the hydrogen consumption rate is quite high and the catalyst deactivation rate is also quite high. The Applicants discovered that lowering the content of the non-aromatic compounds by distillation to produce a material having a non-aromatic compound content of 1% by weight or less, in combination with reacting that resulting material in the presence of hydrogen and a catalyst containing mordenite and between about 0.02 to 2% by weight rhenium to diminish the benzene content of the resulting material and converting at least a portion of the resulting material into C7 or C8 aromatic hydrocarbons produces excellent quantities of product utilizing a surprisingly low amount of hydrogen and results in a surprisingly long catalyst life. This is demonstrated in Example 1 in the Applicants' Specification. It can be seen that the invention uses over 25% less hydrogen and essentially doubles the life of the catalyst. The Applicants respectfully submit that one of ordinary skill in the art would have had no reasonable expectation of such results by reference to King. Doubling the life of the catalyst is a surprising result when taken alone. Reducing the hydrogen use by at least 25% is also surprising taken alone. Achieving both results at the same time is truly amazing.

The Applicants respectfully submit that King is completely inapplicable inasmuch as King essentially discloses a one-step process wherein mixed aromatic hydrocarbon starting material containing at least about 20 mole% of C9 aromatic compounds converts into an aromatic

hydrocarbon product enriched in toluene and/or xylenes results from contacting the starting material with a catalyst of palladium on a dealuminated mordenite having an Si/Al atomic ratio of about 12 to 30. It can readily be seen that King has no appreciation for the importance of the presence of the non-aromatic compounds in typical crude starting material and that there is a dramatic result associated with reducing those non-aromatic compounds to a prescribed level prior to the reaction step. Careful scrutiny of the entire King disclosure, detailed as it may be, demonstrates that King utterly failed to have any appreciation for this claimed aspect of the invention. It therefore inherently follows that it would hardly be obvious to utilize the step of lowering the content of the non-aromatic compounds by distillation to produce a material having a non-aromatic compound content of 1% by weight or less prior to the reaction step. In fact, the Applicants respectfully submit that King is completely non-enabling as prior art in that respect. King simply cannot teach or suggest something when it does not have any disclosure at all concerning the aspect at issue. Moreover, even if the “admitted” art discussed in the Applicants’ Specification is considered, there is still utterly no teachings or suggestions in the combined disclosures that would lead one of ordinary skill in the art to the Applicants’ claimed two-step process.

The Applicants respectfully submit that their Specification and the results disclosed therein, submitted under oath and representing real life experiments actually performed, demonstrate unexpected results beyond which one of ordinary skill in the art could or would reasonably expect based on the disclosure of King. Thus, King is inapplicable and the Applicants respectfully request withdrawal of the 35 U.S.C. §103 rejection.

In light of the foregoing, the Applicants respectfully submit that the entire Application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,



T. Daniel Christenbury
Reg. No. 31,750
Attorney for Applicants

TDC:lh
(215) 656-3381